Abstract

A system and method for high speed and precision measurement of the distance between at least two near contact surfaces using heterodyne interferometry is disclosed. One of the surfaces is an optically transparent element and the other surface is a substantially non-transparent element. A laser source produces an output having two superimposed orthogonally polarized beams having S and P polarization, with a frequency difference between them. The polarized beams are split into measurement and reference beams without altering the characteristics of the polarized beams. The reference beams are caused to interfere, and a reference photo detector detects the reference beams and provides a reference signal. The measurement beam strikes the object of interest at an oblique angle after passing through a glass plate having a polarization coating on the bottom surface close to the object of interest. The oblique angle is such that the S polarization of the incident beam is reflected from the bottom surface of the polarization coated glass plate and the P polarization refracts through the glass plate. The P polarization reflects from the substantially non-transparent object of interest and refracts to the glass plate. The reflected S and P polarization beams from the bottom surface of the glass plate and the surface of the object are made to interfere. A measurement photo detector detects the measurement beams and provides a measurement signal. The distance between the bottom surface of the glass disk and the object surface based on the phase deference between the measurement and reference signals is determined from the measurement and reference photo detectors.